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The Medical Basis for Radiation-Accident Preparedness III
The Psychological Perspective

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Direct and Outside Influences on the Psychological Health of a Marshall Island Population Exposed to Radioactive Fallout

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INTRODUCTION

In 1954, a serious fallout accident occurred during the U.S. Atomic Testing Program at Bikini in the Marshall Islands. Following the detonation of a large thermonuclear device, an unexpected shift in winds resulted in significant fallout exposure of 250 Marshallese, 28 American servicemen on atolls to the east, and 23 Japanese fishermen on their vessel the Lucky Dragon. The people on the exposed islands were evacuated to a naval base at Kwajalein Atoll, where an emergency medical team, organized by the U.S. Navy at the request of the Atomic Energy Commission (AEC), carried out initial examinations on the exposed people.[1] At the end of the examinations, the U.S. Army continued the examinations of the servicemen in Hawaii. The island of Utirik was considered safe for habitation at that time, and the people were returned to live there. However, Rongelap Island was too contaminated, and these people were moved to a temporary village at Majuro Atoll. In 1957, Rongelap was considered safe for habitation, and the people were moved back to a new village that had been constructed for them. The Japanese vessel returned to Japan, where the fishermen received treatment.

Repercussions from the accident have been widespread. This report concerns some of the complex problems that developed in the aftermath of the accident that influenced the psychological impact on the people's exposure from fallout. The report is based largely on the author's experiences during the 26 years that he visited the islands with medical teams to examine and care for the exposed Marshallese people.

A brief review of the principal medical findings is presented below for background purposes. The findings have been published in detail in Brookhaven National Laboratory reports and in medical journals. Comprehensive reviews can be found in References 1-6, which refer to other reports as well.

MEDICAL FINDINGS

In contrast to the irradiation of the Japanese at Hiroshima and Nagasaki, much of which was caused by direct exposure to atomic detonations, the exposure of the Marshallese was caused entirely by fallout. To the people on

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Rongelap 100 miles away, the detonation of the bomb was awe-inspiring and caused considerable concern. The flash of detonation illuminated the island as at midday. The large, red fireball looked like the sun rising in the west. This light was followed moments later by the thunderous roar of the concussion, knocking out windows and shaking coconuts from the trees. Several hours later, the sky became murky, and a snow-like powder fell for a number of hours. It left a white coating on everything, and some of it stuck on the skin and got into the hair. Many complained of lacrimation and itching and burning sensations of the skin. During the first day or so, most of the people had nausea, and a few vomited and had diarrhea. Fallout on Rongerik, where the American servicemen were, was less, and none was visible on Utirik, 200 miles to the east. No symptoms were observable in the people on these islands. Injury resulted from penetrating whole-body gamma radiation, spotty irradiation of the skin from deposits of fallout, and internal absorption of radionuclides, mainly from the ingestion of contaminated food and water. The 86 people on Rongelap received the greatest exposure, up to 1.75 Gy (175 rad) from gamma radiation, skin doses of several thousand rad of soft beta radiation, and internal absorption of radionuclides, the most important of which were radioiodines. The latter resulted in thyroid doses ranging up to 10 Gy (1000 rad) in the adults and more than 50 Gy (5000 rad) in young children.[7] The 157 people on the island of Utirik received much smaller doses than did the residents of Rongelap. Although the doses from internal emitters might have been less had the people taken precautionary measures to avoid ingestion or inhalation of the radioactive fallout, a lack of radio communication with their islands contributed to their not being advised in a timely fashion to do so.

The doses received were sublethal. Early effects in the Rongelap people consisted of transient gastrointestinal symptoms, temporary depression of blood elements (white cells and platelets), numerous "burns" of the skin, and epilation, which healed within a few months.[1] During the past 36 years since the accident, except for the development of thyroid abnormalities produced by exposure to radioactive iodine in the fallout, few positive findings have been related to radiation exposure. Fertility, based on birth rate, has been about the same in the exposed as in the unexposed populations examined. One death from leukemia was probably related to radiation exposure. The development of brain tumors in three exposed women were questionably related to radiation exposure. Total mortality and mortality from cancer has been about the same in both the exposed and unexposed groups.

No genetic effects have been detected in the children of exposed people. The most widespread late effects of their radiation exposure have been the development of thyroid abnormalities, consisting of benign and malignant neoplasms and hypofunction of the thyroid gland associated with growth retardation in some of the Rongelap children. About one-third of the Rongelap people, a lesser number of Utirik, and a few of the unexposed people have developed thyroid neoplasia. Surgical removal of the neoplasms has been carried out in U.S. hospitals with few complications. No deaths have occurred related to thyroid problems. The use of thyroid hormone treatment

has been important in enhancing growth in the growth-retarded children and preventing clinical evidence of thyroid hypofunction.

PSYCHOLOGICAL MANIFESTATIONS

The organization and conduct of the medical program on these tiny islands in this remote area of the world has been a formidable undertaking. The medical teams have had to face many unexpected and unique problems.[6] On arrival in the Marshall Islands in 1954, the team was faced with the medical care of a population whose ethnic background, life style, and language were quite different from ours. The language barrier proved to be one of the most difficult problems we had to face. The exposed people, quite understandably, developed strong psychological and psychosomatic reactions to their exposure. They had sustained the definite radiation effects described above. Because it was necessary for the team to carry out numerous examinations and tests to detect possible radiation effects associated with a type of radiation exposure about which little was known, the interpretation was naturally that the exposure and its effects must indeed be serious.

The people developed exaggerated and unfounded fears about the effects of this mysterious "poisonous powder" to which they had been exposed. These fears were not only related to their initial exposure, but to the low levels of radiation that contaminated their islands when they returned to live there. Their fears were expressed in many ways. Unexposed people moving to the islands also voiced these complaints. The complaints were not substantiated by clinical findings. They claimed that their exposure made them feel weak, as did drawing blood. Almost all illnesses and deaths were believed to be associated with their radiation exposure. About one year after their exposure, the Rongelap women became particularly upset about a rumor that they were not going to be able to have children. (This rumor was shortlived when there were increasing numbers of births of normal babies.) In spite of our assurance that there were no detectable effects in the children of exposed parents, they continued to worry about this possibility. Although we saw no evidence for it, some of the people claimed that the products of miscarriage were abnormal. They believed that some ailments common to the Marshall Islands, such as fish poisoning and irritation of the mucous membranes from eating arrowroot flour (an effect produced when the flour is improperly prepared), had been made worse by the fallout.

Numerous meetings were held with the people, and through Marshallese interpreters, the team tried to correct the misconceptions and to explain the effects of radiation and the need for the examinations. The results were disappointing. Explaining a complicated subject to an unsophisticated people was very difficult, particularly when hampered by a language barrier.

A number of complex outside influences aggravated the reaction of the Marshallese to their radiation exposure and adversely affected the medical program.[6,8,9] Local politicians, lawyers representing the people, and antinuclear groups became increasingly vocal in their criticisms of the United States' handling of the accident, and these criticisms received extensive publicity. A

number of regrettable aspects to the accident itself enhanced these criticisms.[10] The Rongelap people had not been moved to another location prior to the Bravo accident as they had been prior to the first atomic test at Operation Crossroads because no fallout problem was expected. In the confusion following the accident, the extent of the fallout was not at first realized, and evacuation of the exposed people was delayed. Evacuation of the Americans on Rongerik Atoll was carried out before the Marshallese were removed from their islands.

Among the criticisms that developed was the accusation that the United States had deliberately allowed the Marshallese people to be exposed to fallout to study the effects of radiation on human beings and that the people were being used as guinea pigs. This view was strengthened by the fact that routine medical care was the responsibility of the Trust Territories and not of the AEC or the periodically visiting teams. Thus, despite the fact that a large amount of routine care was delivered by the visiting medical experts, the aura of a purely research effort was difficult to dispel.

The United States was suspected of not telling the whole story. Early after the accident, a certain amount of secrecy existed, and early press releases tended to underplay the extent of the accident.[10] Although our first medical report was classified for a short while, subsequent reports were unclassified, and no attempts were made to influence our medical group in any way concerning our reports. Subsequent AEC reports were also unclassified, and no attempt was made to hide data. However, the Commission was plagued with Marshallese suspicions about U.S. reports for some time. The medical team represented the American presence in the islands and were sometimes referred to as the "AEC doctors." In spite of good rapport with and the cooperation of the people in the medical examinations, the team was also subject to some degree of suspicion.

Bitterness among the Marshallese grew, not only about the effects of radiation they had suffered, but also about other factors affecting their lives. At the district centers, they lived in crowded, sometimes unhygienic conditions. They were exposed to an evolutionary process of Westernization imposed by the presence of the United States in the islands.[6,9] They became dependent on subsidization and compensation money. They tended to lose their self-reliance and incentive to carry on their native skills. Rather than fish, it was easier to buy a can of tuna, the fish possibly caught in their own waters and processed in Japan.

The influence of the news media was strong. A few examples are presented in References 11 to 18. When the Marshallese patients came to the U.S. hospitals, radio, newspapers, magazine articles, and even television gave them considerable coverage. The death of a young Rongelap man from leukemia strongly affected the people in the Marshall Islands. The journalist, Stewart Alsop, who was a patient in the hospital and a roommate of the young man, wrote several provocative articles about him.[19] The extensive publicity about the Marshallese Islanders no doubt impressed the affected people with the seriousness of their exposure and their plight as victims of the accident.

Another outside influence that caused problems came from an unexpected quarter, Japan. We had established close ties with the Radiation Effects Research Foundation studying the Japanese who had been exposed to the atomic bombs. One member of our team (Conard) had visited Dr. T. Kumatori for the examination of the fishermen exposed on the Lucky Dragon. Kumatori, in turn, had participated in one of the Marshall Islands surveys. While in Japan, the author was surprised at the emotional reaction of the public to the Bravo accident and the exposure of the fishermen on the Lucky Dragon to the "ashes of death." The groups in Japan protesting atomic and hydrogen weapons had become increasingly vocal in their criticisms of the U.S. Atomic Testing Program and the handling of the Marshallese victims of the Bravo accident. Marshallese politicians invited to Japan returned with the complaint that the Japanese doctors did not have access to the findings of our medical team and claimed that the people were being treated as guinea pigs.[20]

Arrangements were made for two Japanese doctors to visit the Marshall Islands and to go to Rongelap to study the fallout victims. When this group arrived in the Marshall Islands, they were turned back by the authorities because they did not have the proper visas for their mission.[21] This infuriated the Marshallese politicians. The U.S. refusal was reported as resulting from our hiding of information.[22] Shortly after this, when we went to Rongelap to carry out our examinations, the people had been told not to allow the team to examine them. The survey had to be aborted. The Congress of Micronesia became involved and arranged our next examinations to include several well-known physicians, two from Japan, one from England, and one from the United States to accompany the team and evaluate its medical program. The examinations went well, and the reports of the observers were quite favorable to the conduct of the medical program.[23] This favorable review did much to quell further interference in the program.

The psychological effects of radiation exposure were borne out by further events at Rongelap. As was pointed out, when the people returned to live on Rongelap, slight residual contamination remained on the island, but regular radiation monitoring of the islanders by sensitive gamma spectroscopy and radiochemical urinalyses, as well as by radioecological studies, showed that the island was safe for habitation. Nevertheless, the people continued to worry about radiation on the island, and the politicians were suspicious concerning the U.S. reports. Finally, in 1985, the Rongelap people were evacuated by a Greenpeace ship, the Rainbow Warrior, to a small island at Kwajalein Atoll, where living conditions were most unsatisfactory. The Marshallese engaged an independent group to examine the U.S. reports concerning the radiological situation on Rongelap. This group concluded, after examining numerous U.S. reports, that the island was safe for habitation.[24] However, the Marshallese were still dissatisfied with the reports and petitioned the U.S. Congress for further proof of the safety of their island. The matter is being reviewed at present by a congressional committee.[25]

Another unfortunate consequence of the atomic testing program was the necessity to move the people of Bikini Atoll prior to Operation Crossroads

in 1946. This move was thought to be temporary. But the island was used for continuing tests, and by the time of the testing moratorium in 1958, was too contaminated for rehabilitation. Instead, attempts were begun to decontaminate the island. The resettlement of the Bikini people has been fraught with difficulties. The people were not happy on the islands to which they were moved. An attempt to recolonize several families on Bikini had to be abandoned when it was found that radiation levels on the island were higher than previously reported. In the meantime, the United States has allocated funds to the Bikini people to make their atoll safe for habitation.

It will probably be several years before either Bikini or Rongelap are inhabited again. Many of the older people may never realize their dream of returning to live on their home islands. No matter how efficient the cleanup and the rehabilitation of these islands, it seems likely that the people will never be completely free of lingering fears and psychological effects concerning the presence of this "poisonous white powder" that fell on their islands.

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REFERENCES

1. Cronkite, E. P., Bond, V. P., Dunham, C. L. (Eds.): *Some Effects of Ionizing Radiation on Human Beings: A Report on the Marshallese and Americans Accidentally Exposed to Radiation from Fallout and a Discussion of Radiation Injury in the Human Being*, TID-5358, U.S. Atomic Energy Commission, [Oak Ridge, Tenn.] (1956).

2. Conard, R. A., et al.: *A Twenty-Year Review of Medical Findings in a Marshallese Population Accidentally Exposed to Fallout Radiation*, BNL-50424, Brookhaven National Laboratory, Upton, N.Y. (1975).

3. Conard, R. A., et al.: *Review of Medical Findings in a Marshallese Population Twenty-Six Years After Accidental Exposure to Radioactive Fallout*, BNL-51261, Brookhaven National Laboratory, Upton, N.Y. (1980).

4. Conard, R. A.: Late radiation effects in Marshall Islanders exposed to fallout 28 years ago, pp. 57-71 in Boice, L. D., Jr., Fraumeni, J. F., Jr. (Eds.): *Radiation Carcinogenesis: Epidemiology and Biological Significance*, Raven Press, New York (1984).

5. Adams, W. H., Heotis, P. M., and Scott, W. A.: *Medical Status of Marshallese Accidentally Exposed to 1954 Bravo Radiation: January 1985 through December 1987*, BNL-52192, Brookhaven National Laboratory, Upton, N.Y. (1989).

6. Conard, R. A.: *Fallout: The Experiences of a Medical Team in the Care of a Marshallese Population Accidentally Exposed to Fallout Radiation*, Brookhaven National Laboratory, Upton, N.Y. (in preparation).

7. Lessard, E. T., et al.: *Thyroid-Absorbed Dose for People at Rongelap, Utirik, and Sifo on March 1, 1954*, BNL-51882, Brookhaven National Laboratory, Upton, N.Y. (1985).

8. Hines, N. O.: *Proving Grounds: An Account of the Radiological Studies in the Pacific 1946-1961*, University of Washington Press, Seattle (1962).

9. Kahn, E. J., Jr.: A reporter at large. Micronesia revisited, pp. 98-115, *The New Yorker* (Dec. 18, 1971).

10. Hacker, B. C.: *Elements of Controversy: A History of Radiation Safety in the Nuclear Testing Program*, Reynolds Electric Co., Las Vegas, Nev. (1985).

11. Anon.: Atom fallout victims in Boston for surgery, *Record American* (June 1966).

12. Anon.: Atomic aftermath, p. 70, *Newsweek* (June 25, 1956).

13. Anon.: Islanders still dread fallout despite full physical recovery, p. 6, *The New York Times* (May 22, 1959).

14. Simons, Harold: Bomb fallout damage appears in test victims, *Washington Post* (Nov. 3, 1965).

15. Anon.: Six South Pacific atom victims undergo tests at Argonne, *Chicago Daily News* (Apr. 6, 1957).

16. Anon.: Radiation tells its tale in South Pacific, *Medical World News* (August 1965).

17. Anon.: Thyroid concern in fallout victims, *J. Am. Med. Assoc.* (Dec. 1, 1969).

18. Sullivan, Walter: Marshall Islander's death tied to fallout, p. 26, *The New York Times* (Nov. 21, 1972).

19. Alsop, Stewart: Lekoj and the unusable weapon, p. 114, *Newsweek* (Oct. 30. 1972).

20. Burris, Jerry: "Human guinea pigs" charge roils U.S.-Micronesia relations, *Honolulu Advertiser* (Apr. 28, 1972).

21. Anon.: Bikini fact-finding team refused entry, *Masanobu Tanake, Mainichi Daily News* (Dec. 16, 1971).

22. Anon.: What are we hiding?, *Pacific Daily News* (Dec. 22, 1971).

23. Congress of Micronesia: Affairs at the legislative council, News Release No. 10, Congress of Micronesia, Kolonia (July 3, 1972).

24. Kohn, Henri L.: *Reassessment Report Pursuant to Compact of Free Association, Oct., 1985*, Berkeley, Calif. (July 1988).

25. Marshall, E.: Fallout from Pacific tests reaches Congress, *Science* 245, 123-124 (1989).